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Standard Specification for Wire Cloth and Sieves for Testing Purposes¹

This standard is issued under the fixed designation E 11; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the requirements for design and construction of testing sieves using a medium of woven wire cloth mounted in a frame for use in testing for the classification of materials according to designated particle size (See Notes 1 and 2), and wire cloth, meeting the specifications of Table 1, to be designated test grade wire cloth. All subsequent references to wire cloth shall mean test grade wire cloth. Methods for checking testing sieves and wire cloth for conformance to this specification are included in the annex.

NOTE 1—Complete instructions and procedures on the use and calibration of testing sieves are contained in *ASTM STP447B*.² Note that sieve analysis results from two testing sieves of the same sieve designation may not be the same because of the variances in sieve opening permitted by this specification. To minimize the differences in sieve analysis results, the use of testing sieves matched on a performance basis is suggested. *ASTM STP447B*² also contains a list of all published ASTM standards on sieve analysis procedures for specific materials or industries. This list may be referenced to obtain statements of precision and bias for sieve analysis of specific materials.

NOTE 2—For other types of sieves, see Specification E 323 and Specification E 161.

1.2 The values stated in SI units shall be considered standard for the dimensions of the wire cloth openings and the diameter of the wires used in the wire cloth. The values stated in inch-pound units shall be considered standard with regard to the sieve frames.

1.3 The following precautionary statement refers only to the test method portion, Annex A1, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

C 430 Test Method for Fineness of Hydraulic Cement by the 45- μ m No. 325 Sieve³

E 161 Specification for Precision Electroformed Sieves (Square-Opening Series)⁴

¹ This specification is under the jurisdiction of ASTM Committee E-29 on Particle Size Measurement and is the direct responsibility of Subcommittee E29.01 on Sieves, Sieving Methods, and Screening Media.

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² *Manual on Testing Sieving Methods, ASTM STP 447B*. Available from ASTM Headquarters.

³ *Annual Book of ASTM Standards*, Vol 04.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

E 323 Specification for Perforated-Plate Sieves for Testing Purposes⁴

E 437 Specifications for Industrial Wire Cloth and Screens (Square Opening Series)⁴

2.2 Federal Standard:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)⁵

2.3 Military Standard:

MIL-STD-129 Marking for Shipment and Storage⁵

3. Ordering Information

3.1 Orders for items under this specification include the following information as necessary:

3.1.1 Name of material (U.S.A. Standard Testing Sieves or U.S.A. Standard sieve cloth),

3.1.2 ASTM designation and year of issue (ASTM E 11 – 95),

3.1.3 Quantity of each item,

3.1.4 Standard sieve designation (see Table 1, Column 1),

3.1.5 Alternative sieve designation if needed (see Table 1, Column 2),

3.1.6 For testing sieves in standard circular frames:

3.1.6.1 Nominal sieve frame diameter (see 5.2 and 5.3),

3.1.6.2 Nominal sieve frame height (see Table 2),

3.1.7 For sieve cloth not in frames or in nonstandard frames:

3.1.7.1 Lateral dimensions of sieve cloth,

3.1.7.2 Description of nonstandard frame,

3.1.8 For U.S. Government purchases, if supplementary requirements apply,

3.1.9 Compatible sieve pans and covers, and

3.1.10 Special requirements (specific type of metal for sieve cloth and frames, matched sieves, for example).

4. Sieve Cloth Requirements

4.1 Wire cloth used in U.S.A. standard testing sieves meeting the specifications shown in Table 1 shall be designated "test grade". Test grade sieve cloth shall be woven from stainless steel, brass, bronze, or other suitable wire with a plain weave, except that cloth with openings of 63 μ m (No. 230) and finer may be woven with a twill weave. For definitions of "plain" and "twill" weave, refer to Specification E 437. The wire shall not be coated or plated.

4.2 The openings of the sieve cloth of successive sieves progress from a base of 1 mm in the ratio of approximately $4\sqrt{2}:1$.

4.3 All measurements of openings and wire diameters

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

TABLE 1 Nominal Dimensions, Permissible Variations for Wire Cloth of Standard Test Sieves (U.S.A.) Standard Series

Sieve Designation		Nominal Sieve Opening, in. ^B	Permissible Variation of Average Opening from the Standard Sieve Designation	Opening Dimension Exceeded By Not More Than 5 % of the Openings	Maximum Individual Opening	Nominal Wire Diameter, mm ^C
Standard ^A	Alternative					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
125 mm	5 in.	5	±3.70 mm	130.0 mm	130.9 mm	8.00
106 mm	4.24 in.	4.24	±3.20 mm	110.2 mm	111.1 mm	6.30
100 mm ^D	4 in. ^D	4	±3.00 mm	104.0 mm	104.8 mm	6.30
90 mm	3½ in.	3.5	±2.70 mm	93.6 mm	94.4 mm	6.30
75 mm	3 in.	3	±2.20 mm	78.1 mm	78.7 mm	6.30
63 mm	2½ in.	2.5	±1.90 mm	65.6 mm	66.2 mm	5.60
53 mm	2.12 in.	2.12	±1.60 mm	55.2 mm	55.7 mm	5.00
50 mm ^D	2 in. ^D	2	±1.50 mm	52.1 mm	52.6 mm	5.00
45 mm	1¾ in.	1.75	±1.40 mm	46.9 mm	47.4 mm	4.50
37.5 mm	1½ in.	1.5	±1.10 mm	39.1 mm	39.5 mm	4.50
31.5 mm	1¼ in.	1.25	±1.00 mm	32.9 mm	33.2 mm	4.00
26.5 mm	1.06 in.	1.06	±.800 mm	27.7 mm	28.0 mm	3.55
25.0 mm ^D	1.00 in. ^D	1	±.800 mm	26.1 mm	26.4 mm	3.55
22.4 mm	¾ in.	0.875	±.700 mm	23.4 mm	23.7 mm	3.55
19.0 mm	¾ in.	0.750	±.600 mm	19.9 mm	20.1 mm	3.15
16.0 mm	¾ in.	0.625	±.500 mm	16.7 mm	17.0 mm	3.15
13.2 mm	0.530 in.	0.530	±.410 mm	13.83 mm	14.05 mm	2.80
12.5 mm ^D	½ in. ^D	0.500	±.390 mm	13.10 mm	13.31 mm	2.50
11.2 mm	⅞ in.	0.438	±.350 mm	11.75 mm	11.94 mm	2.50
9.5 mm	⅞ in.	0.375	±.300 mm	9.97 mm	10.16 mm	2.24
8.0 mm	⅞ in.	0.312	±.250 mm	8.41 mm	8.58 mm	2.00
6.7 mm	0.265 in.	0.265	±.210 mm	7.05 mm	7.20 mm	1.80
6.3 mm ^D	¼ in. ^D	0.250	±.200 mm	6.64 mm	6.78 mm	1.80
5.6 mm	No. 3½ ^E	0.223	±.180 mm	5.90 mm	6.04 mm	1.60
4.75 mm	No. 4	0.187	±.150 mm	5.02 mm	5.14 mm	1.60
4.00 mm	No. 5	0.157	±.130 mm	4.23 mm	4.35 mm	1.40
3.35 mm	No. 6	0.132	±.110 mm	3.55 mm	3.66 mm	1.25
2.80 mm	No. 7	0.110	±.095 mm	2.975 mm	3.070 mm	1.12
2.36 mm	No. 8	0.0937	±.080 mm	2.515 mm	2.600 mm	1.00
2.00 mm	No. 10	0.0787	±.070 mm	2.135 mm	2.215 mm	0.900
1.7 mm	No. 12	0.0661	±.060 mm	1.820 mm	1.890 mm	0.800
1.4 mm	No. 14	0.0555	±.050 mm	1.505 mm	1.565 mm	0.710
1.18 mm	No. 16	0.0469	±.045 mm	1.270 mm	1.330 mm	0.630
1.00 mm	No. 18	0.0394	±.040 mm	1.080 mm	1.135 mm	0.560
850 µm ^F	No. 20	0.0331	±35 µm	925 µm	970 µm	0.500
710 µm	No. 25	0.0278	±30 µm	775 µm	815 µm	0.450
600 µm	No. 30	0.0234	±25 µm	660 µm	695 µm	0.400
500 µm	No. 35	0.0197	±20 µm	550 µm	585 µm	0.315
425 µm	No. 40	0.0165	±19 µm	471 µm	502 µm	0.280
355 µm	No. 45	0.0139	±16 µm	396 µm	426 µm	0.224
300 µm	No. 50	0.0117	±14 µm	337 µm	363 µm	0.200
250 µm	No. 60	0.0098	±12 µm	283 µm	306 µm	0.160
212 µm	No. 70	0.0083	±10 µm	242 µm	263 µm	0.140
180 µm	No. 80	0.0070	±9 µm	207 µm	227 µm	0.125
150 µm	No. 100	0.0059	±8 µm	174 µm	192 µm	0.100
125 µm	No. 120	0.0049	±7 µm	147 µm	163 µm	0.090
106 µm	No. 140	0.0041	±6 µm	126 µm	141 µm	0.071
90 µm	No. 170	0.0035	±5 µm	108 µm	122 µm	0.063
75 µm	No. 200	0.0029	±5 µm	91 µm	103 µm	0.050
63 µm	No. 230	0.0025	±4 µm	77 µm	89 µm	0.045
53 µm	No. 270	0.0021	±4 µm	66 µm	76 µm	0.036
45 µm	No. 325	0.0017	±3 µm	57 µm	66 µm	0.032
38 µm	No. 400	0.0015	±3 µm	48 µm	57 µm	0.030
32 µm	No. 450	0.0012	±3 µm	42 µm	50 µm	0.028
25 µm ^D	No. 500	0.0010	±3 µm	34 µm	41 µm	0.025
20 µm ^D	No. 635	0.0008	±3 µm	29 µm	35 µm	0.020

^A These standard designations correspond to the values for test sieve openings recommended by the International Standards Organization, Geneva, Switzerland, except where noted.

^B Only approximately equivalent to the metric values in Column 1.

^C The average diameter of the wires in the x and y direction, measured separately, of any wire cloth shall not deviate from the nominal values by more than ±15 %.

^D These sieves are not in the standard series but they have been included because they are in common usage.

^E These numbers (3½ to 635) are the approximate number of openings per linear in. but it is preferred that the sieve be identified by the standard designation in millimetres or micrometres.

^F 1000 µm—1 mm.

shall be made along the midpoints of the opening as shown in Fig. 1.

4.4 Sieve cloth shall conform to the dimensional requirements of Table 1. The average opening (distance between parallel wires measured at the center of the opening), in the x

(horizontal) and y (vertical) directions measured separately, shall conform to the values in Column 1, within the permissible variation in average opening size shown in Column 4. Not more than 5 % of the openings shall exceed the value shown in Column 5. The maximum individual

TABLE 2 Dimensions of Standard Frames

Nominal Diameter	Mean Diameter, in. (mm)		Typical Frame ^A
in.	Inside at Top ^B	Outside on Skirt	Nominal Height ^C in. (mm)
3	3.000 + 0.030/-0.000 (76 + 0.76/-0.00)	3.000 + 0.000/-0.030 (76 + 0.00/-0.76)	1¼ (32) FH ^D ⅝ (16) HH
6	6.000 + 0.030/-0.000 (152 + 0.76/-0.00)	6.000 + 0.000/-0.030 (152 + 0.00/-0.76)	1¾ (45) FH 1 (25) HH
8	8.000 + 0.030/-0.000 (203 + 0.76/-0.00)	8.000 + 0.000/-0.030 (203 + 0.00/-0.76)	2 (50) FH 1 (25) HH
10	10.000 + 0.030/-0.000 (254 + 0.76/-0.00)	10.000 + 0.000/-0.030 (254 + 0.00/-0.76)	3 (76) FH 1½ (38) HH
12	12.000 + 0.030/-0.000 (305 + 0.76/-0.00)	12.000 + 0.000/-0.030 (305 + 0.00/-0.76)	3¼ (83) FH 2 (50) IH 1⅝ (41) HH

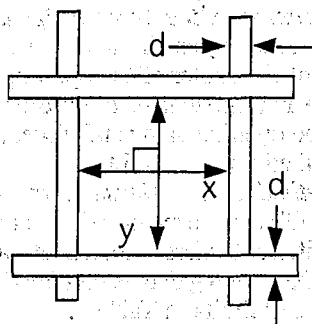
^A Other frame heights are not precluded.^B Measured 0.2 in. (5 mm) below the top of the frame.^C Distance from the top of the frame to the sieve cloth surface.^D FH = full height; HH = half height; IH = intermediate height.

FIG. 1 Proper Dimensioning of Wire Cloth Mesh

opening size shall not exceed the value shown in Column 6.

4.4.1 The average diameter of the x (horizontal) and y (vertical) wires, measured separately, shall conform to the diameter in Column 7 within the tolerances in Footnote A of Table 1.

4.5 Wires shall be crimped in such a manner that they will be rigid when in use.

4.6 There shall be no punctures or obvious defects in the cloth.

5. Test Sieve Frames

5.1 *General Requirements*—Frames for wire cloth sieves shall be constructed in such a manner as to be rigid. The wire cloth shall be mounted on the frame without distortion,

looseness, or waviness. To prevent the material being sieved from catching in the joint between the wire cloth and the frame, the joint shall be filled smoothly or constructed so that the material will not be trapped.

5.2 *Standard Frames*—Sieve frames shall be circular with nominal diameters of 3, 6, 8, 10, or 12 in. (76, 152, 203, 254, or 305 mm) as may be specified. The dimensions shall conform to the requirements in Table 2. Frames shall be made from noncorrosive material such as brass or stainless steel and be of seamless construction.

5.2.1 The bottom of the frame shall be constructed so as to provide an easy sliding fit with any sieve frame of the same nominal diameter conforming to the specified dimensions.

5.2.2 The joint or fillet at the connection of the sieve cloth to the frame will provide a minimum clear sieving surface with a diameter equal to the nominal diameter less 0.5 in. (13 mm).

NOTE 3—Attention is called to Test Method C 430, which contains requirements for 2 in. (51 mm) diameter sieves used in the mineral industry, especially the cement group.

5.3 *Nonstandard Frames*—Other sieve frames may be either square, rectangular, or circular. The frame may have the sieve cloth permanently installed, or may be designed to permit replacement. The provisions of 5.1 apply.

NOTE 4—While there are no requirements for nesting of nonstandard sieve frames, care should be applied in use to prevent loss of material during analysis.

5.4 *Pans and Covers*—Pans and covers for use with sieves shall be made so as to nest with the sieves. Pans with extended rims ("stacking skirts") shall be furnished when specified. The pans and covers shall conform to the dimensions in Table 2.

6. Product Marking

6.1 Each test sieve shall bear a label marked with the following information:

- 6.1.1 U.S.A. standard testing sieve,
- 6.1.2 This designation (ASTM E-11),
- 6.1.3 Standard sieve designation (from Table 1, Column 1),
- 6.1.4 Name of manufacturer or distributor, and
- 6.1.5 Alternative sieve designation (from Table 1, Column 2) (optional).

7. Keywords

7.1 opening; particle size; sieve; sieve analysis; sieve cloth; sieve designation; test grade wire cloth; test sieve

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the contract or order.

S1. Responsibility for Inspection

S1.1 Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. Except as otherwise specified in the contract or order, the producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser. The

purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that materials meet the specification.

S2. Government Procurement

S2.1 Unless otherwise specified in the contract, the materials shall be packaged in accordance with the suppliers'

standard practice that will be acceptable to the carrier at lowest rates. Containers and packing shall comply with the Uniform Freight Classification rules or National Motor

Freight Classification rules. Marking for shipment of such materials shall be in accordance with Fed. Std. No. 123 for civil agencies, and MIL-STD-129 for military agencies.

ANNEX

(Mandatory Information)

A1. TEST METHODS FOR CHECKING WIRE CLOTH AND TESTING SIEVES TO DETERMINE WHETHER THEY CONFORM TO SPECIFICATION

A1.1 Every opening in the metal wire cloth in a test sieve shall be eligible for inspection for compliance with the requirements listed in Table 1.

A1.1.1 When a sieve has 30 openings or less, measure all openings. In other cases the examination shall proceed in stages from a survey of general condition, to a methodical scrutiny of individual openings, and finally to measurement of opening size for compliance with the tolerances.

A1.1.2 Measure opening size, as described in Test Methods Two, Three, and Four, on equipment with a precision of at least 2.5 μm or 10 % of the value in Column 4 for the specific mesh designation, whichever is greater.

A1.2 *Test Method One—Examination of General Condition of the Wire Cloth*—For this purpose, view the sieve cloth against a uniformly illuminated background. If obvious deviations, for example, weaving defects, creases, wrinkles, foreign matter in the cloth, are found, the wire cloth is unacceptable.

A1.3 *Test Method Two—Examination for Maximum Individual Opening*—The observer shall carefully and methodically examine the appearance of all the openings, in order to detect oversize openings. Openings whose width deviates by about 10 % of the average value are apparent to the unaided eye of a skilled observer. By this test method, known as the "handicap method", it is probable that all oversize openings exceeding the average value by about 10 % or more will be detected. At the same time it is easily possible to detect sequences of large openings, and local irregularities in the weaving, appearing as distortions in the openings. If an opening is found to be larger than that permissible in accordance with Column 6 of Table 1, the wire cloth is unacceptable.

A1.4 *Test Method Three—Determination of the Size Distribution of Wire Cloth Openings*—To establish the size distribution of sieve openings, determine the frequency of opening size measurements using the following procedures:

A1.4.1 For samples (testing sieves or wire cloth) with 30 or less openings, measure all full openings. For samples with

over 30 openings, measure a minimum of 30 full openings.

A1.4.2 Select openings in a line or lines diagonal to the direction of the wires according to Fig. A1.1, and measure ten adjacent openings along each line. When greater numbers of openings are available, choose the fields in such a manner that none of the openings being measured overlap.

A1.4.3 *Measurement of the Average Opening Size*—Measure the average opening as the distance between parallel wires (measured at the center of the opening—see Fig. 1) in both directions, being sure to keep the x and y measurements separate. Once the opening data is tabulated, check the data versus the prescribed limits in Table 1.

A1.5 *Test Method Four—Measurement of the Average Wire Diameter*—Obtain the average diameter of the wires by measuring 30 different wires selected at random in each direction. Once the opening data is tabulated, check the data versus the prescribed limits in Table 1.

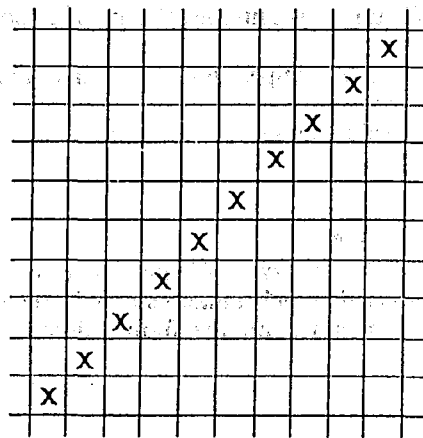


FIG. A1.1 Orientation of Openings to be Measured in Each Field

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